

What is claimed is:

1. A fault repairing method for a liquid crystal display device, comprising the steps of:

5 forming first and second disconnection repairing contact holes, that have a width larger than a width of a disconnected wiring and a depth to expose an upper surface and both side surfaces of the disconnected wiring respectively, at two locations which are positioned to sandwich a disconnected portion of the disconnected  
10 wiring; and

15 forming first and second conductive films, that are connected electrically to the upper surface and both side surfaces, on inner walls and surfaces of the first and second disconnection repairing contact holes to repair the disconnection.

2. The fault repairing method for a liquid crystal display device according to claim 1, wherein the first and second conductive films are formed by a laser CVD method.

20 3. A fault repairing method for a liquid crystal display device, comprising the steps of:

25 forming first and second disconnection repairing contact holes, that have a width larger than a width of a disconnected wiring and a depth to expose an upper surface and both side surfaces of the disconnected wiring respectively, at two locations which are positioned to sandwich a disconnected portion of the disconnected

wiring; and

5 forming a conductive film, that is connected electrically to the upper surface and both side surfaces, on inner walls and surfaces of the first and second disconnection repairing contact holes to repair the disconnection.

4. The fault repairing method for a liquid crystal display device according to claim 3, wherein the conductive film is formed by a laser CVD method.

10 5. The fault repairing method for a liquid crystal display device according to claim 1, wherein both the first and second conductive films are connected to a pixel electrode.

15 6. A fault repairing method for a liquid crystal display device comprising the steps of:

forming a conductive film over an area located between disconnection end portions of a disconnected wiring by a laser CVD method; and

20 connecting electrically the conductive film and the disconnection end portions by a laser welding method to repair the disconnection.

25 7. A liquid crystal display device in which a liquid crystal is sealed between a first substrate, on which first and second wirings intersected via an insulating film are formed, and a second substrate that opposes to the first substrate, comprising:

spare wirings that are formed in vicinity of

intersecting positions of the first and second wirings and constitute a part of a detour route used when an interlayer short-circuit between the first and second wirings is repaired.

5       8. A liquid crystal display device in which a liquid crystal is sealed between a first substrate, on which first and second wirings intersected via an insulating film are formed, and a second substrate that opposes to the first substrate, comprising:

10      spare pads that are connected to any one of the first and second wirings in vicinity of intersecting positions of the first and second wirings and constitute a part of a detour route used when an interlayer short-circuit between the first and second wirings is repaired.

15      9. A fault repairing method for a liquid crystal display device comprising the steps of:

20      disconnecting one wiring of first and second wirings in which an interlayer short-circuit occurs, at two locations that sandwich a short-circuit portion to separate electrically from other wiring; and

        forming a detour route to detouring the short-circuit portion to connect electrically disconnection end portions of one wiring.

25      10. The fault repairing method for a liquid crystal display device according to claim 9, wherein the detour route contains spare wirings, that are formed in vicinity of an intersecting position of the first and second

wirings to repair an interlayer short-circuit between the first and second wirings, as a part of its configuration.

11. The fault repairing method for a liquid crystal display device according to claim 9, wherein the detour route contains spare pads, that are connected to any one of the first and second wirings in vicinity of an intersecting position of the first and second wirings to repair an interlayer short-circuit between the first and second wirings, as a part of its configuration.

10           12. A liquid crystal display device comprising:  
               a plurality of gate bus lines;  
               a plurality of storage capacitance bus lines;  
               a storage capacitance bus line general electrode connected commonly to the storage capacitance bus lines,  
15             and arranged to intersect with the plurality of gate bus lines to sandwich an insulating film;  
               repairing auxiliary wirings that are intersected with the storage capacitance bus line general electrode and are provided electrically independently from the gate bus lines; and

20             repairing connecting electrodes arranged on both sides of the storage capacitance bus lines general electrode in a width direction respectively, one ends of which overlap with the gate bus lines and other ends of  
25             which overlap with the repairing auxiliary wirings.

13. The liquid crystal display device according to claim 12, wherein the repairing auxiliary wirings are

formed by same steps as the gate bus lines.

14. The liquid crystal display device according to claim 12, wherein the repairing connecting electrodes are formed by same steps as the storage capacitance bus line general electrode.

15. A fault repairing method of repairing a short-circuit between a gate bus line and a storage capacitance bus line general electrode in a liquid crystal display device that includes a plurality of gate bus lines, a plurality of storage capacitance bus lines, and a storage capacitance bus line general electrode that is connected commonly to the plurality of storage capacitance bus lines and intersected with the gate bus lines to sandwich an insulating film between them, comprising the steps of:

15 forming repairing auxiliary wirings to intersect with the storage capacitance bus line general electrode; forming repairing connection electrodes one ends of which are connected to the gate bus lines and other ends of which are connected to the repairing auxiliary wirings; and

20 disconnecting a gate bus line, that is short-circuited to a storage capacitance bus line general electrode, on both sides of the storage capacitance bus line general electrode.

25 16. A fault repairing method of repairing a short-circuit between a gate bus line and a storage capacitance bus line general electrode in a liquid crystal display

device that includes a plurality of gate bus lines, a plurality of storage capacitance bus lines, and a storage capacitance bus line general electrode that is connected commonly to the plurality of storage capacitance bus lines and intersected with the gate bus lines, comprising the steps of:

forming repairing auxiliary wirings to intersect with the storage capacitance bus line general electrode;

disconnecting a gate bus line, that is short-circuited to a storage capacitance bus line, on both sides of the storage capacitance bus line general electrode;

exposing two locations of the gate bus line to sandwich the storage capacitance bus line general electrode between them;

exposing two locations of the repairing auxiliary wiring to sandwich the storage capacitance bus line general electrode; and

depositing a conductive film on an area extended from an exposed portion of the gate bus line to an exposed portion of the repairing auxiliary wiring to connect electrically the gate bus line to the repairing auxiliary wiring.

17. A fault repairing method for a liquid crystal display device that includes switching thin film transistors that are connected to gate bus lines, data bus lines and pixel electrodes, and spare thin film

transistors that are not connected to the data bus lines, comprising the step of:

5 forming a conductive pattern, that connects a drain electrode of a spare thin film transistor and a data bus line, in repairing a fault.

10 18. The fault repairing method for a liquid crystal display device according to claim 17, wherein the conductive pattern is formed by a laser CVD method or by baking conductive chemicals by virtue of a laser beam 15 irradiation.

15 19. The fault repairing method for a liquid crystal display device according to claim 17, wherein the spare thin film transistor is separated from the pixel electrode, a source electrode of the spare thin film transistor and the pixel electrode are connected by a laser welding in repairing the fault.

20 20. The fault repairing method for a liquid crystal display device according to claim 17, wherein contact holes are opened in an insulating film on the drain electrode of a spare thin film transistor and on a drain electrode of a switching thin film transistor, by laser beam irradiation before forming the conductive pattern.

25 21. The fault repairing method for a liquid crystal display device according to claim 17, wherein the conductive pattern is formed of any one metal selected from a group consisting of tungsten, molybdenum, chromium, gold, and silver.

22. A fault repairing method for a liquid crystal display device that includes switching thin film transistors that are connected to gate bus lines, data bus lines and pixel electrodes, and spare thin film transistors that are not connected to the gate bus lines, comprising the step of:

5 forming a conductive pattern, that connects at least a gate electrode of a spare thin film transistor and a gate bus line, in repairing a fault.

10 23. The fault repairing method for a liquid crystal display device according to claim 22, wherein the conductive pattern is formed by a laser CVD method or by baking conductive chemicals by virtue of a laser beam irradiation.

15 24. The fault repairing method for a liquid crystal display device according to claim 22, wherein the spare thin film transistor is separated from the pixel electrode, a source electrode of the spare thin film transistor and the pixel electrode are connected by a laser welding in repairing the fault.

20 25. The fault repairing method for a liquid crystal display device according to claim 22, wherein contact holes are opened in an insulating film on the gate electrode of a spare thin film transistor and on the gate bus line of a switching thin film transistor, by laser beam irradiation before forming the conductive pattern.

25 26. The fault repairing method for a liquid crystal

display device according to claim 22, wherein the conductive pattern is formed of any one metal selected from a group consisting of tungsten, molybdenum, chromium, gold, and silver.

5        27. A liquid crystal display device comprising:  
            switching thin film transistors that are connected  
            to gate bus lines, data bus lines and pixel electrodes;  
            and

10        spare thin film transistors that are not connected  
            to the gate bus lines, wherein a part of the gate bus  
            lines are provided as a gate electrode of the spare thin  
            film transistor.

15        28. A liquid crystal display device comprising:  
            switching thin film transistors that are connected  
            to gate bus lines, data bus lines and pixel electrodes;  
            and

20        spare thin film transistors that are not connected  
            to the gate bus lines, wherein a gate electrode of the  
            spare thin film transistor is arranged between the data  
            bus line and the pixel electrode.

25        29. A fault repairing method for a liquid crystal  
            display device that includes a plurality of bus lines  
            formed on a substrate, TAB terminals arranged along a  
            first side of the substrate and connected to the bus  
            lines respectively, and repair wirings arranged along a  
            second side opposing to the first side, comprising the  
            step of:

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forming at least a conductive pattern for connecting electrically a bus line and a repair wiring, in repairing the fault.

5           30. The fault repairing method for a liquid crystal display device according to claim 29, wherein the conductive pattern is formed by a laser CVD method or by baking conductive chemicals by virtue of a laser beam irradiation.

10          31. The fault repairing method for a liquid crystal display device according to claim 29, wherein a plurality of repair wiring are provided.

15          32. The fault repairing method for a liquid crystal display device according to claim 29, wherein contact holes are opened on the bus lines and the repair wirings, by laser beam irradiation before forming the conductive pattern.

20          33. The fault repairing method for a liquid crystal display device according to claim 29, wherein the conductive pattern is formed of any one metal selected from a group consisting of tungsten, molybdenum, chromium, gold, and silver.

25          34. A liquid crystal display device comprising:  
                  a plurality of first bus lines on a substrate;  
                  a plurality of second bus lines intersected with  
                  the plurality of first bus lines via an insulating film;  
                  a plurality of TAB terminals arranged along a first  
                  side of the substrate and connected to the plurality of

first bus lines respectively; and

repair wirings arranged along a second side opposing to the first side, the repair wirings having no wiring that intersects with the repair wirings before a fault is repaired.

35. A liquid crystal display device comprising:

a plurality of first bus lines on a substrate;

a plurality of second bus lines intersected with the plurality of first bus lines via an insulating film;

10 a plurality of TAB terminals arranged along a first side of the substrate and connected to the plurality of first bus lines respectively;

repair wirings arranged along a second side opposing to the first side;

15 repair terminals of the first bus lines provided along the second side;

first connecting pads exposed on the repair terminals and connected electrically to the repair terminals; and

20 second connecting pads exposed on the repair wirings and connected electrically to the repair wirings.

36. The liquid crystal display device according to claim 35, wherein the repair wirings and the first connecting pads are arranged on an outside of a color filter substrate opposing to the substrate for sealing liquid crystal between them.

37. The liquid crystal display device according to

claim 35, wherein a repair TAB terminal is formed adjacently to the TAB terminals.

38.The liquid crystal display device according to claim 37, the repair TAB terminal is connected to the first bus line in repairing the fault.  
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